

# **Department of Resources Recycling and Recovery**

## **Scope of Work**

### **I. INTRODUCTION/OBJECTIVES**

- Assembly Bill (AB) 341 (Chesbro, Stats. of 2011, Ch. 476) mandates a 75 percent statewide recycling goal by 2020; recycling organics will play a major role in achieving the statewide goal since organic materials comprise the largest waste category.
- AB 32 (Núñez, Stats. of 2006, Ch. 488) mandates significant greenhouse gas (GHG) emission reductions by 2020 that equal 1990 baseline; increased production and use of composted organic wastes are included in statewide plans to meet that goal.

#### **Potential Increase in Direct Land Application of Organics**

Some organic materials are directly applied to land as a very low or no-cost source of nutrients and organic matter. Direct land application of organics is an area of growing interest and concern due to: 1) increased pressure to divert organics from landfills, 2) the potential unintended consequences of new policies or regulatory actions that result in higher costs for operators of permitted composting facilities and thus provide more impetus for land application, and 3) the effect on the environment and public health from contaminants that some greenwaste may contain. Recent actions include new rules adopted by regional air quality management districts, and/or orders and permit conditions enforced by the State Water Resources Control Board or Regional Water Quality Control Board. Additional concerns arise from the imminent closure in 2013 of one of California's largest landfills, which uses 1,000 tons per day of greenwaste as alternative daily cover. These materials will need to find other destinations, and direct land application may be an alternative that is considered, given that few compost facilities are located near the closing landfill.

Furthermore, while siting or expanding composting sites is extremely challenging (for example, due to New Source Review, best available control technologies, criteria air pollutant offsets, stormwater and groundwater protection requirements), direct land application of organic materials has few requirements. Currently, under Title 14 regulations, landowners who wish to apply fresh ground greenwaste to their property can be determined by the Local Enforcement Agency to be using the material beneficially. Land application can also be deemed beneficial if it meets California Department of Food and Agriculture requirements. In only a few counties do property owners need to notify local authorities and/or obtain any local permits.

#### **Potential Increased GHG and VOC Emissions with Direct Land Application**

Greenwaste produces both GHG and volatile organic compound (VOC) emissions in the course of degradation. This occurs whether the materials are composted in a well-managed process at a permitted facility, or whether these materials are allowed to degrade on their own, such as when left in place, or when directly applied to land. The concern is the relative amount of GHG and VOC emissions from land application of uncomposted material versus from composting activities. Direct land application may result in increased GHG emissions due to the potential for

anaerobic degradation which produces methane, similar to what occurs in a landfill. Laboratory studies conducted for CalRecycle indicate that unmanaged degradation, such as direct land application, produces more VOC emissions than well managed composting. The amount and characterization of GHG emissions from compost production and use is currently being studied in an ongoing, multi-year research project that concludes in 2014. However, the amount and characterization of VOC and GHG emissions from the direct application of uncomposted greenwastes to land has not been previously investigated.

### **Potential Impacts to Water Quality with Direct Land Application**

When greenwaste is applied directly to land without composting or other processes to stabilize the material, it creates a potential for groundwater contamination. One constituent of concern for groundwater is nitrate, which is a wide-spread problem in agricultural areas of California. In addition, dissolved organic carbon, the major ions comprising ‘salts’ (including, but not limited to, sodium, magnesium, calcium and potassium), minor metal ions such as copper and zinc, and non-metals such as selenium may impact water quality.

### **Summary**

The purpose of this study is to measure GHG and criteria pollutant emissions and water quality constituents of concern from surface application and various levels of incorporation of greenwaste directly to land and to compare these measurements to previous estimates of emissions from greenwaste from different types of facilities, including from composting facilities. The study will use scientifically valid sampling techniques to measure emissions to air and constituents of concern in water that is either migrating downward or running off the surface. The measurement period will include periods of hot, dry weather as well as winter rains and irrigation events. Laboratory analysis will measure all major constituents of concern, and will seek out other potential contaminants, including pesticides.

## **II. WORK TO BE PERFORMED**

The Contractor shall design and implement a field study to provide the best possible estimate of the greenhouse gas and criteria pollutant emissions from various treatments of fresh, source-separated, chipped and ground greenwaste applied directly to agricultural land. Concurrent with the air emissions testing, the Contractor shall design and implement a test on the same plots of land to measure leaching of greenwaste constituents of concern (listed above) into the groundwater and potential for contaminated surface runoff.

Features of the testing regimen shall include:

- Comparison of different methods of direct land application, including surface application, incorporation 2-3” deep and incorporation up to 12” deep.
- Air emissions testing over a sufficient period of time to capture the vast majority of air emissions from degradation, and consistent with standard land management practices for use of direct application.

- Constituents of concern for air quality testing include, but are not limited to, volatile organic compounds, methane, nitrous oxide (N<sub>2</sub>O) and ammonia.
- Water quality testing over a sufficient period of time to capture releases to groundwater and surface water, as well as the effects of winter rainfall and warm season irrigation events on releases.
  - Constituents of concern for water testing include, but are not limited to, nitrates, major ions, metals and pesticides.
- Use of scientifically appropriate sampling mechanisms, sample holding and transport techniques, and laboratory procedures.
  - Sufficient replicate plots and controls to create a scientifically valid experiment.

After the field work and laboratory analysis is completed, the Contractor shall analyze all data and use the information to reach scientifically valid conclusions. The field work, analysis and conclusions shall be combined into a draft report and submitted to the Contract Manager. Contractor shall work with the Contract Manager to address questions and comments about the draft report, and based on that effort, will complete a final report which meets CalRecycle standards for format, quality of writing, presentation of data and scientific support for all conclusions. The report, supporting documents and data shall be of sufficient quality and scientific rigor to be relied upon by CalRecycle and stakeholders such as the California Air Resources Board and the State Water Resources Control Board for policy decisions and derivative works.

### III. TASKS IDENTIFIED

The project will consist of the four major tasks listed below.

**Task 1: Preparation and Planning of Field Research Project.** The Contractor shall develop a detailed Work Plan, subject to approval by the Contract Manager. The Work Plan shall include the following components:

- Characterization of soil types used for study plots.
- Detailed air emissions monitoring and sampling plan.
- Detailed water quality monitoring and sampling plan (Note: Will necessitate use of lysimeters, wells or other engineered sampling device to capture releases to or toward groundwater and surface water, as well as the effects of winter rainfall and warm season irrigation).
- Protocols for handling and analysis of all samples

**Task 2: Implementation of Field Research Project.** Contractor shall implement the field research project as indicated in the Work Plan. Implementation elements include:

- Arrange for the use of a plot or multiple plots of land for the duration of the study.
- Obtain a source of freshly ground, source-separated greenwaste and apply to the land per the detailed study Work Plan.

- Obtain all sampling equipment and analysis instruments.
- Gather samples per the sampling plan.
- Analyze samples per test protocols and accepted scientific methods.

**Task 3: Provide Regular Updates to CalRecycle Staff and other Stakeholders.** The Contractor shall provide progress updates at least monthly and participate in conference calls to discuss project progress when requested. The Contractor shall attend meetings to discuss project progress and outcomes with CalRecycle personnel and external bodies, such as air quality regulators, upon reasonable notice from Contract Manager.

**Task 4: Provide Draft and Final Reports.** The Contractor shall prepare and submit a draft report that describes the field study approach and methodology and presents the results. The report shall include an executive summary containing a summary of the field study and key findings. The report shall present all methodologies, calculations, and assumptions critical to the development of conclusions about the emissions from land application of green wastes, including justification for making any assumptions. To the extent possible, the Contractor shall report environmental impact data for direct land application in units per ton of green wastes applied for each application method. Additionally, to the extent possible, the report shall compare environmental impacts of direct land application with impacts from other organic materials management options, such as composting and in-vessel anaerobic digestion..

Technical writing in the report should be adequate to clearly explain the study logic, scientific processes used, and the results. Contractor shall include supporting technical documents and calculations in the report as appendices.

After allowing a sufficient time for CalRecycle review of the draft report, Contractor shall incorporate comments from the Contract Manager, make all necessary changes or corrections, and produce a final report suitable for posting on the CalRecycle web site. Documents created for this contract must be in a format acceptable for inclusion on the CalRecycle's website and adhere to the CalRecycle Contractor Publication Guidelines (available at <http://www.calrecycle.ca.gov/Publications/PubGuide/>). In addition to following the CalRecycle Contractor Publication Guidelines, the Contractor shall include appropriate object/image tagging that allows for wider public accessibility to study results. Multiple report revisions may be required by the Contract Manager prior to his/her written approval of the Final Report.

## I. CONTRACT/TASK TIME FRAME

<i>Action/Work Product</i>	<i>Approximate Date</i>
Initial project team meeting	June 28, 2013
Study plan	September 1, 2013
Field work	Oct. 2013-Oct. 2014
Laboratory work	Nov. 2013-Nov. 2014
Draft Report	January 15, 2015
Final Report	March 30, 2015